

What is Claimed is:

1. A semiconductor processing apparatus comprising;

a chamber;

5 a wafer support member within the chamber;

a gas inlet pipe for flowing processing gas down into a top part of the chamber at an exit-end of the pipe; and

10 an impeller mounted within the pipe above the exit-end thereof, the impeller directing the gas flowing down within the pipe into a plurality of lateral secondary gas streams rotating beneath the impeller to cause a swirling whirlpool-like motion of the gas.

15 2. The apparatus of claim 1 wherein the swirling gas flows into the top part of the chamber.

20 3. The apparatus of claim 2 wherein centrifugal forces cause the swirly gas to flow outward across the chamber so that on passing down onto a wafer on the holder the gas flows uniformly across an exposed surface of the wafer.

4. The apparatus of claim 1 wherein the impeller is disc-shaped and comprises a plurality of fan-like blades which partly overlap each other.

25 5. The apparatus of claim 4 wherein the blades radiate from a center to an outer rim and are fixed in the pipe at right angles athwart the gas stream above the exit-end of the pipe.

30 6. The apparatus of claim 5 wherein the blades are spaced apart where they overlap such that a plurality of streams of processing gas flow between the blades and are directed into a swirling motion.

35 7. The apparatus of claim 1 wherein the apparatus has a central vertical axis and the chamber, and the wafer support member, and the gas inlet pipe are aligned along this axis along with the center of the impeller.

8. The apparatus of claim 1 further comprising a gas exhaust pipe for removing used processing gas from a

lower portion of the chamber beneath the wafer support member.

9. Semiconductor apparatus useful to control processing gas flowing onto a wafer held within the chamber, the apparatus comprising:

a chamber having an upper portion and a lower portion;

a platform for holding a wafer for the processing thereof within the chamber;

a gas pipe for flowing processing gas down through an exit-end thereof into the upper portion of the chamber; and

an impeller which comprises a plurality of fan-like blades radiating from a center to an outer rim, the blades being circumferentially spaced and overlapping each other with a front edge of one blade being beneath and ahead of a rear edge of the next blade and so on, there being respective spaces between the blades where they overlap, the spaces between the blades forming secondary gas passageways for directing respective streams of gas laterally beneath the impeller into a rotational swirling motion, the impeller being fixed within the gas pipe above its exit-end, such that when the swirling gas beneath the impeller flows into the upper portion of the chamber internal forces cause the gas to flow outward across the chamber and then down evenly onto and over a wafer on the platform.

10. The apparatus of claim 9 wherein the blades of the impeller are generally flat and are tilted sufficiently to provide the spaces between the overlapping portions of the blades, inner ends of the blades being joined at a center, outer rims of the blades being fixed within the gas pipe such that the impeller is athwart the gas flow at right angles thereto.

11. The apparatus of claim 9 wherein there is a vertical center axis with which the gas pipe, the chamber, and the platform are aligned along with the center of the impeller.

5 ~~13~~. A method of evenly spreading processing gas onto and over the surface of a semiconductor wafer, the method comprising the steps of:

generating a whirlpool-like laterally swirling
10 motion in the gas stream; and

15 14. The method of claim 13 wherein the gas is caused to swirl by passing the gas flowing downward in the pipe through a fixed impeller which directs the gas flow into a plurality of secondary gas streams which flow laterally and rotationally within the pipe.